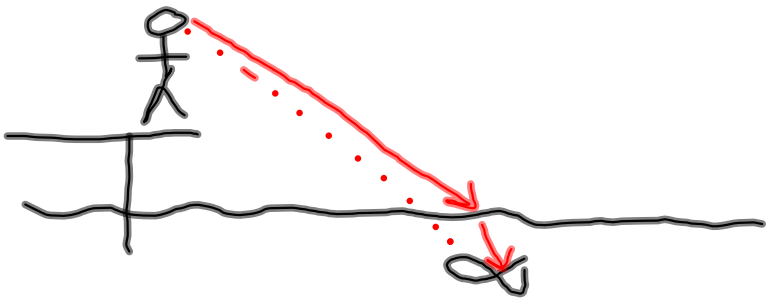
Test TOMORROW!

- Waves
- Sound
- Light



- Because the angle changes, we want to aim at the front of the fish to hit it.

- What changes when light enters a new medium?

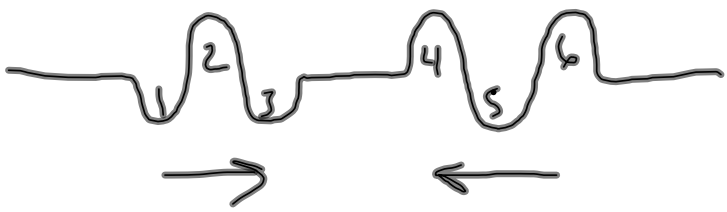
$V = \lambda f$ → this stays constant

↳ this also changes

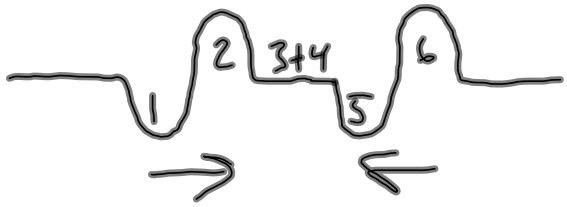
↳ this changes.

We can understand this because the color (which is related to frequency) does not change.

1)

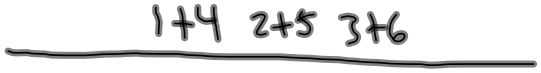


2)

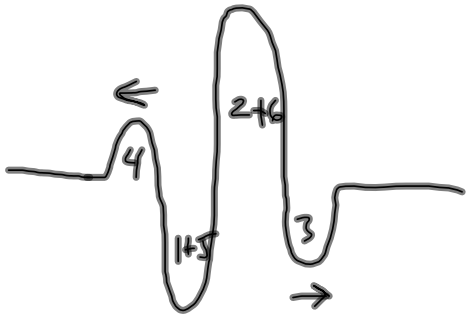


3)

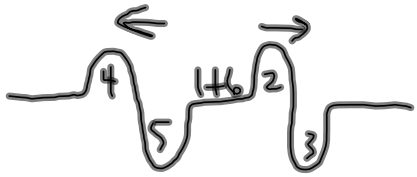
4)



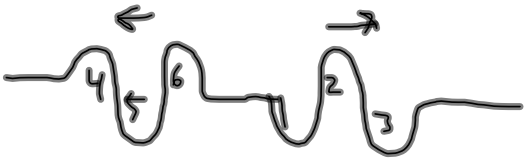
5)



6)



7)

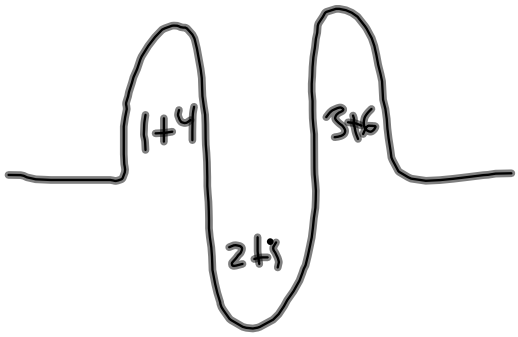


1)

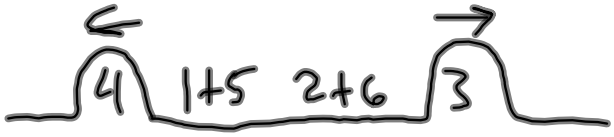
2)

3)

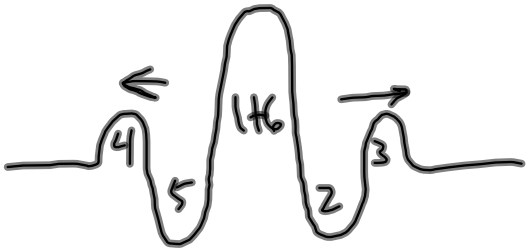
4)



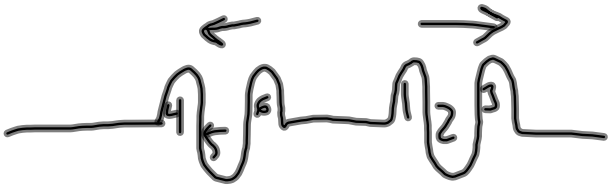
5)



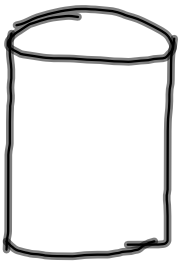
6)



7)



An open/open pipe playing the 7th order frequency has a frequency of 4500 Hz. If the speed of sound in air is 343 m/s, what is the length of the pipe?



$$f_n = \frac{nv}{2L}$$

$n = 7$

$f_n = 4500\ Hz$

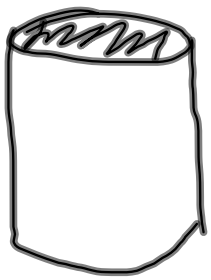
$v = 343\ m/s$

$$L = \frac{nv}{2f_n}$$

$$= \frac{(7)(343\ m/s)}{2(4500\ Hz)}$$

$$= 0.27\ m$$

An open/closed pipe has a length of 4.56 m. What frequency is produced at the following harmonics if the velocity of sound in air is 343 m/s?
a) 3rd order frequency
b) 4th order frequency
c) 9th order frequency



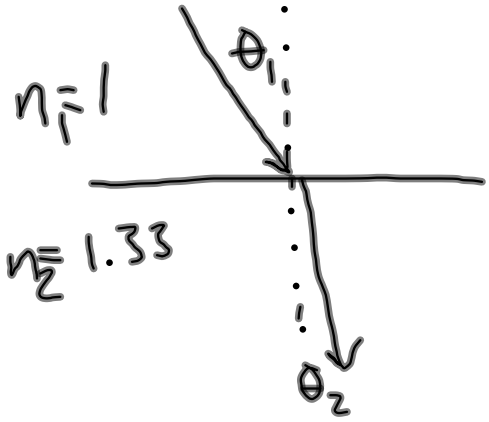
$$f_n = \frac{nv}{4L}$$

a) $f_3 = \frac{(3)(343\ m/s)}{4(4.56\ m)} = 56.4\ Hz$

b) $f_4 =$ Does Not Exist

c) $f_9 = \frac{(9)(343\ m/s)}{4(4.56\ m)} = 169\ Hz$

Light travels from air (n = 1) to water (n = 1.33), and the incoming angle is 34 degrees. What is refracted angle as the light enters the water?

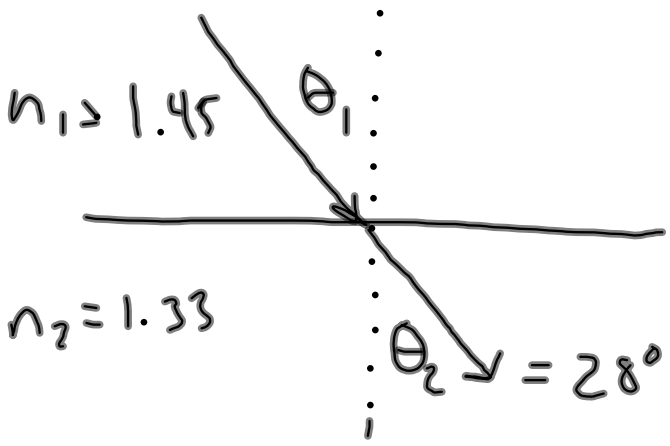


$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$\theta_2 = \sin^{-1}\left(\frac{n_1}{n_2}\sin\theta_1\right)$$

$$= 24.9^\circ$$

A light beam travels from glass (n = 1.45) to water (n = 1.33). If the beam leaves at 28 degrees, what angle did the beam enter the boundary?



$$n_1 \sin\theta_1 = n_2 \sin\theta_2$$

$$\theta_1 = \sin^{-1}\left(\frac{n_2}{n_1}\sin\theta_2\right)$$

$$= 25.5°$$

$V = f\lambda$

$c = f\lambda$

Speed of a wave

$f = \frac{1}{T}$

relationship between frequency and period

$n = \frac{c}{v}$

index of refraction

$E = hf$

energy of light

$n_1 \sin\theta_1 = n_2 \sin\theta_2$ Snell's law

$I = \frac{P}{4\pi r^2}$

intensity of sound

$f_n = \frac{nv}{2L}$ $n = 1, 2, 3, \ldots$

open/open pipe
strings

$f_n = \frac{nv}{4L}$ $n = 1, 3, 5 \ldots$

open/closed pipe